

THE MUD CRAB

A report on the Seminar convened
in Surat Thani, Thailand, November 5-8, 1991

REPORT OF THE SEMINAR ON THE MUD CRAB CULTURE AND TRADE
held at Swat Thani, Thailand, November 5-8,1991

Edited:
C.A. ANGELL
Sr. Aquaculturist
BOBP

The mud crab, *Scylla* sp. found throughout the Indo-Pacific region. has become increasingly popular by virtue of its meat quality and large size. While regional trade in the species has been growing. very little attention has been given to the fishery and culture in the Bay of Bengal region.

The fishery, culture and trade in *Scylla* sp. is small-scale and involves artisanal fisherfolk, thus attracting the interest of the Bay of Bengal Programme (BOBP). As little is known of the state of the fishery, culture and trade. it was felt that a regional seminar might be an appropriate medium for an exchange of information among BOBP's member countries. A seminar would also provide an opportunity to update knowledge of the industry.

Southern Thailand, particularly the province of Surat Thani. has long been a centre for the capture and culture of the mud crab. With the proximity of the provincial brackishwater station and the opportunity to observe the industry first-hand. the town of Surat Thani promised to be an ideal venue for the seminar. And so. BOBP. in collaboration with the Department of Fisheries (DOCF) of the Government of Thailand, convened the seminar from November 5 to 8. 1991

Representatives from all the BOBP member countries, as well as the Philippines. Australia and U.S.A., attended. Aquaculturists, scientists. businessmen. socio-economists. feed manufacturers and development strategists were among the 54 participants.

There were five sessions: Biology and natural resources. Seed supply, Culture. Trade and a combined session with focus on Extension. Credit and Economic. During these sessions, 22 papers and six backgrounders were presented. To our knowledge, this was the first seminar in the region. and perhaps the world. devoted exclusively to the mud crab.

The Bay of Bengal Programme (BOBP) is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrate\ and promotes new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in member-countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom. by member-governments in the Bay of Bengal region, and also by AGFUND (Arab Gulf Fund for United Nations Development Organizations) and UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

This document has not been cleared by the FAO or by the governments concerned.

September 1992

CONTENTS

Summary of the proceedings of the seminar on the mud crab

PAPERS

Biology and natural resources

- A review of the culture, marketing and resources of the mud crab (*Scylla serrata*) in the Bay of Bengal region 5
— K Sivasubramaniam and C Angell
- A review of the status of the mud crab (*Scylla* Sp.) fishery and culture in Indonesia 13
Fuad Cholikh and Adi Hanafi
- The mud crab (*Scylla serrata*) fishery and its bio-economics in Bangladesh 29
— Md Giasuddin Khan and Md Fokhrul Alam
- The mud crab fishery in Sri Lanka 41
— S C Jayamanne
- Biological studies of the mud crab *Scylla serrata* (Forsk.) of the mangrove ecosystem in the Andaman Sea 49
— Sombat Poovichiranon
- A brief overview of the ecology and fisheries of the mud crab. *Scylla serrata*. in Queensland 59
Christopher Lee
- Mud crab production in Thailand 65
S Tookwinas, N Srichantulk and C Kanchanavasitc
- An overview of the mud crab fishing gear in the Philippines 71
Daisy F Ladra and Jericardo S Mondragon
- Resource and exploitation of mud crab *Scylla serrata* (Forsk.) in India 84
M Kathirvel and S Srinivasagam
- Mud crab A potential aqua-resource of Bangladesh 95
Md Kador Ahmed
- A review of the mud crab (*Scylla serrata*) fishery on the east coast of India and in Kerala state 103
— M Mahesh Raj
- Taxonomy of the mud crab, *Scylla srrata* (Forsk.), from India 127
M Kathirvel and S Srinivasagam

Seed supply

- Experiments on larval rearing and seed production of the mud crab *Scylla serrata* (Forsk.) 135
R Marichamy and S. Rajapackiam

Preliminary studies on rearing the larvae of the mud crab (<i>Scylla serrata</i>) in Malaysia — Zainoddin Bin Jamari	143
 Culture	
Mudcrab fattening practices in the Philippines — Daisy F Ladra	151
Results of trials of mud crab (<i>Scylla serrata</i>) fattening — L Bede D De Silva	155
Pond culture of mud crab in Sri Lanka — R P Samarasinghe, D Y Fernando and O S S C de Silva	161
Status, constraints and potential of mud crab fishery and culture in Sri Lanka Chin How-Cheong and H P Amandakoon	165
Mud crab (<i>Scylla serrata</i> Forskal) fattening in Surat Thani province — Anuwat Rattanachote and Rachada Dangwatanakul	171
Formulation of artificial feeds for mud crab culture: A preliminary biochemical, physical and biological evaluation Chin How-Cheong, U P D Gunasekera and H P Amandakoon	179
The fattening and culture of the mud crab (<i>Scylla serrata</i>) in Malaysia — Liong Pit Chong	185
Rearing of mud crab (<i>Scylla Serrata</i>) — Suparp Prinpanapong and Thaweesak Youngwanichsacd	191
A review of experimental culture of the mud crab, <i>Scylla Serrata</i> (Forsk), in India — S Srinivasagam and M Kathirvel	195
 Trade	
Mud crab storage and transport in Australian commerce — N C Gillespie and J B Burke	207
Trade and marketing practices of mud crab in the Philippines — Daisy F Ladra and Jeff C Lin	211
 Extension, credit and economics	
Pond culture of mud crab (<i>Scylla serrata</i>): an economic analysis — Giselle P B Samonte and Renato F Agbayani	225
Mud crab fattening technology transfer to the small-scale fisherfolk of Ranong Province, Thailand — Hanne Kristensen	235
Abbreviations used in the References	240
Publications of the Bay of Bengal Programme	244

SUMMARY OF THE PROCEEDINGS
OF THE SEMINAR ON THE MUD CRAB
Convened in Surat Thani, THAILAND, November 5-8, 1991,

Biology and natural resources

The mud crab (*Scylla* sp.) is widely distributed throughout the region. The estimated total catch in the Bay of Bengal region is between 9-10,000 t/year. Mud crab culture and fattening operations depend solely on seed collected from the wild. The lack of management controls on the indiscriminate collection of natural seed has led to a decline in mud crab landings in most of the countries in the region. There has also been a gradual reduction in the maximum landed size, another indicator of over-exploitation. These observations call for an immediate focus on the effective management of mud crab resources and their fisheries, as well as on speeding up efforts to improve the existing mud crab seed production techniques in order to support a continued and sustained mud crab resource in the region.

Wide differences observed in coloration, maximum size obtained and preferred habitat have led to the conclusion that more than one species of *Scylla* exists in the region.

Sexual maturity in females is reported to be attained at a carapace width of 9-11 cm. Females migrate offshore to spawn and the larval development occurs in the open sea, while juveniles, subadults and adults occupy mangrove biotopes, estuaries and channels.

Seed supply

Attempts to develop techniques for mud crab seed production in the Bay of Bengal region and elsewhere have been very limited. One of the principal reasons for this slow pace of progress has been a combination of fisheries management control on the collecting of female crab (as in Australia) and the general lack of knowledge about certain aspects of larval and juvenile seed and water quality requirements.

Survival of up to 30 per cent from zoea to first crab stage has been obtained in the laboratory, but this has not been transferred to commercial practice. Continued applied research will be required if the technology is to become economically viable.

Culture

The culture of *Scylla* sp. is of two kinds: fattening and growout. In fattening, post-moult 'water' crab of market size are held for short periods of time and fed until their meat content has increased. Growout operations stock small seed crab, usually in ponds, and provide feed and water exchange until they reach market size.

Crab are held for fattening in a variety of floating cages and pens. Most operations are small-scale and crab may even be kept in individual containers made of plastic or split bamboo and suspended from a raft. Pens can be erected in tidal areas and may even be found under the culturists' homes. Pens are usually quite small, measuring only a few square metres in area.

Trash fish is most commonly used as feed, but fish offal and slaughterhouse waste are also employed when available. Feeding rates are around 10 per cent of estimated bodyweight, although schedules are not rigorously adhered to. Experiments with artificial feeds show promise for future development along these lines.

Seed stock for crab fattening is usually obtained from local markets and dealers where 'water' crab have a relatively low value. Female crab are particularly sought after. Most of these will become gravid during the fattening period and command a significantly higher price when bearing the bright red roe in their ovaries. In Malaysia, stocking material for fattening operations is imported from

Thailand, Sri Lanka and Indonesia. The fattening period may vary from a few days to a month, depending on the condition of the seed stock.

Ponds may also be used for fattening. Such ponds are usually quite small, and are dug by 'trenching', leaving a mound of earth in the centre of the pond which can be used by the crab for burrowing and shelter. In Thailand, fattening ponds range from 500 to 800 m². Most fattening ponds in Malaysia are of a similar size, although a few may reach 1 ha in area. Indonesian crab fattening ponds are around 1000 m². The bunds have to be protected with some kind of facing material to prevent burrowing by the captive crab. Water exchange in these types of ponds is by tides and through simple concrete sluice gates.

Crab fattening is profitable due to the fast turnover rate and good survival. It is also very suitable for small-scale operations as an extra income source for fisherfolk. Its expansion will be constrained by seed shortages as well as feed, principally trash fish.

Crab culture is much less widely practised than fattening. Where it is widespread, in central Java, it is done along extensive lines. High mortality of over 50 per cent often plagues crab culturists, but it can be alleviated by the provision of shelters placed on the bottom of the pond.

Trade

Mud crab trade in the region has shown a consistently increasing trend in the past few years. Malaysia and Singapore are the main markets in the region. Apart from local production, these two countries absorb about 10 t of live mud crab a day, imported from Indonesia, India, Sri Lanka, Bangladesh and the Philippines.

The export of live mud crab from India and Sri Lanka started in the early and mid 80's, respectively, but has been a recent development in Bangladesh.

The fact that mud crab survive in air for about 4-5 days (under optimum conditions) has enabled their shipment to distant markets. Improved packaging and handling techniques have also significantly contributed towards the increase in regional trade.

The preference for ovigerous female crab and the high price they command, as compared to immature females and males, in countries like Malaysia, Singapore, Thailand and Indonesia, is of serious concern due to its implications for recruitment to natural populations.

There seems to be significant fluctuations in the market price of mud crab due to the wide seasonal variations in the landings. Increasing production through culture and fattening could contribute to a more stable situation.

Extension credit and economics

Studies undertaken in the Philippines on the economic viability of mud crab culture in ponds indicate that the operation is economically viable at a stocking rate of 5000 crab/ha, but not at higher stocking densities of 15,000 and 20,000/ha.

Reduction in the investment cost and the development of indigenous methods to suit local conditions, coupled with appropriate financing through institutions, would render crab culture and fattening operations a viable proposition and provide a reliable source of income to low-income groups.

Attempts at extension and training programmes aimed at popularizing mud crab culture and fattening have been very limited in the region. The Bay of Bengal Programme (BOBP), in collaboration with the Department of Fisheries, Thailand, initiated trials in 1987 to transfer the technology of mud crab fattening and culture to small-scale fisherfolk in Ranong Province in southern Thailand. The project was beset with high investment costs, low availability of seed and the reluctance of financial institutions to provide funds. Most operations failed due to heavy mortalities resulting from cannibalism and wide salinity fluctuations.